Resource Manager 300, and CD Writer Control 400 (see FIG. 1). A "module," as used herein, refers to the functionality and not the configuration of components.

The CD Writer Server 100 typically resides on an e-mail server because the CD Writer Server commonly communicates with the customer interface 10 via e-mails. The order fulfillment process is triggered when a customer enters a request through a customer interface 10. A customer interface includes but is not limited to a website, a web server, an electronic commerce transaction system, a customized start page, or an e-mail subsystem. At the interface, the customer is prompted to provide 1) the content(s) he wants duplicated, for example identifiers of songs, movies, or software, 2) the desired quantity, 3) personal information such as the name, address, and phone number of the customer, 4) the desired shipping method, 5) the due date, and 6) a payment or a method of payment, such as a credit card number, among other information. After the request has been entered and the CD Writer Server 100 has scheduled the request, the customer may be able to see an estimated delivery date at the interface 10.

The present system manages payment at the customer interface 10, either through an e-commerce transaction system involving a credit card number, or through an account number to which charges can be made. Managing payment through an e-commerce system significantly reduces the amount of human supervision that is required.

As shown in FIG. 2, the CD Writer Server 100 module that first receives an e-mail order from the customer interface is Log Manager 200. FIG. 3 shows that upon receiving an e-mail, Log Manager 200 first interprets it 210 and extracts certain information, including but not limited to the mailing address. Then, Log Manager 200 time-stamps each incoming e-mail 220 and lines it up in the order of receipt 230, creating a log that CD Writer Control 400 can eventually retrieve and process. In addition, Log Manager 200 sends the extracted mailing address information 240 to an address label printer 600. The printer 600 is optionally attached to the CD Writer Server 100. Log Manager 200 repeats 250 the process with each incoming e-mail request, updating the log with each request.

After Log Manager updates the log, CD Writer Control 400 retrieves the log and examines it 410 in conjunction with the information stored in Resource Manager to schedule the production of CDs. The information CD Writer Control retrieves from Log Manager 200 pertains to the specifics of a request, such as the order quantity and the requested content. In contrast, the information stored in Resource Manager 300 pertains to hardware configuration and digital data that represent contents that can be transferred to a blank medium. As FIG. 2 shows, Resource Manager maintains two types of files: a set of resource files 310, one file for each of the output devices controlled by CD Writer Server, and an archive 320 of all the sounds, images, and characters used to execute the duplication requests.

In one embodiment, there are as many resource files 310 in Resource Manager 300 as there are output devices (hereinafter CD Writers) 500. For example, Resource Manager 300 shown in FIG. 2 stores N resource files 310 because there are N CD Writers 500. Each resource file contains the name and the IP address of each CD Writer 500, the number of drives and printers in each of those machines, and the number of blank CD-Rs remaining in each machine, among other information. Moreover, the resource file 310 keeps track of which data from its archive 320 has been copied to the internal cache 520 of each CD Writer 500 and how much cache space remains in each machine. The latter information becomes

important when some data needs to be purged in order to download new data. As FIG. 2 shows, Resource Manager 300 and CD Writer Control 400 maintain close communication 330 so that every time CD Writer Control 400 sends a write command 440 to one of the CD Writers 500, Resource Manager 300 can update the resource file 310 for that CD Writer.

As mentioned above, Resource Manager 300 also stores an archive 320 of all the sounds, images, and characters used to produce the requested CDs. The archive can be internally indexed by part numbers, each part number being associated with a path name. In one, the hard drive of Resource Manager 300 was designed to hold at least 1,000 CD contents along with corresponding graphics, which are to be physically printed on the CDs (the number of contents the archive can hold depends on the amount of data that each content corresponds to). In order to change or update the contents of the archives an operator would have to delete some of the existing data and download new data from a network or a digital storage medium.

CD Writer Control 400 retrieves information from both Log Manager 200 and Resource Manager 300 to schedule production for each CD Writer 500 connected to the system. In order to optimize production, CD Writer Control 400 must first calculate the process time for each order 412. This calculation is performed by first reading the title of the requested songs or movies from the order log and looking up the size of those songs or movies in the Resource Manager archive. Then, CD Writer Control 400 can schedule the requests according to whatever criteria that best suits the business (i.e., it can be programmed). For example, it can schedule the duplication jobs in the order that the requests were received, to ensure that between two requests with approximately equal process times, the request that was received first will be processed first. Alternatively, it can prioritize the request with a closer due date or an order marked "high priority." Furthermore, if there are multiple orders requesting the same content, CD Writer Control 400 can group those orders so that they can be produced together 414 (but the mailing address labels would be different for each order). Other factors may only be taken into account in the scheduling algorithm.

Since there are different types of CD Writers 500 (for example, CD Writers for DVDs and CD Writers for mini-CDs) with different cache 520 contents and varying numbers of drives 510, scheduling involves careful selection of a CD Writer for each job. CD Writer Control 400 selects (416, 418) a CD Writer 500 based on the hardware configuration data stored in Resource Manager's resource files 310. CD Writer Control 400 would send a job to the next available CD Writer 500 of the appropriate type that already has the requested content in its cache 520. For optimal production, as many machines as possible would be processing orders concurrently.

Once scheduling is complete, CD Writer Control tells the designated CD Writer to begin the duplication process by sending a "write" command in the appropriate machine language 440. However, before sending the "write" command, CD Writer Control 400 must check to make sure there are enough blank CD-Rs 540 loaded in the particular machine, as shown in FIG. 4. CD-R, as used herein, refers to any kind of medium onto which data can be fixed, printed, embodied, or stored, and from which the information fixed, printed, embodied, or stored therein can be perceived, reproduced, used, or otherwise communicated, either directly or indirectly with the aid of a device. Each CD Writer can be designed to hold as many number of CD-Rs as is practical. If there is an insufficient number of blank CD-Rs remaining, CD Writer Control notifies the operator with a short message 448. If